

USAID Agribusiness Linkages Project

AGRILINK

Eastern Cape Province
South Africa

Draft Final Report on

Medicinal Plants

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Table of Contents

| | |
|-------------------------------------------------------------------------------|----|
| Introduction | 3 |
| Some Overarching Issues..... | 3 |
| The International Markets..... | 3 |
| The South African Market..... | 5 |
| The Various Constraints to Developing some of these Potential Markets | 6 |
| Specific recommendations for AGRILINK activities in Eastern Cape Province ... | 11 |
| Plants for the local medicinal (muti) markets..... | 11 |
| Wild Harvested | 11 |
| Cultivation for the muti markets | 11 |
| Plants for the local formal market and the international markets | 12 |
| Wild Harvested | 12 |
| Cultivation for the local formal and international markets | 14 |
| Details on some of the Medicinal plants used/grown in South Africa..... | 15 |
| Aloe | 16 |
| Artemesia | 17 |
| Balanites | 18 |
| Bersama..... | 19 |
| Boophone..... | 20 |
| Bowiea | 21 |
| Cassine | 22 |
| Clivia | 23 |
| Cryptocarya..... | 23 |
| Curtisia | 24 |
| Dioscorea | 25 |
| Eucomis | 26 |
| Gunnera | 27 |
| Harpagophytum..... | 28 |
| Ocotea..... | 28 |
| Pelargonium | 29 |
| Pittosporum | 30 |
| Rapanea..... | 31 |
| Scilla..... | 32 |
| Siphonochilus | 33 |
| Stangeria | 33 |
| Warburgia..... | 34 |
| Xysmalobium..... | 35 |
| Some contact information..... | 38 |
| Local companies..... | 38 |
| European companies..... | 38 |
| US companies | 38 |

Introduction

There has been an explosive growth in the use of plant-based products in the last ten years. Hundreds of plant species are being converted into dozens of different product types, for use across a wide variety of markets. The plant sources may be wild crafted¹ or cultivated or both. The products may be sold as whole dried plants, or as selected plant parts. They may just be sorted and dried, or converted into ground or freeze dried powders, solid dry extracts, fresh liquid extracts, tinctures, distilled to extract oils, or refined and extracted down to single compounds or mixtures of pure chemical substances. These products are used worldwide in almost every sector of the economy, from mining to medicines, cosmetics to curries.

These plants and the derived plant products are traded locally, regionally and internationally, as nutraceuticals², dietary supplements, herbal remedies, teas, phytomedicines, homeopathic drugs, aromatherapy oils, flavors, fragrances and food additives. This multi-billion dollar worldwide industry is both complex and continually changing, so broad generalizations are usually not possible or particularly useful.

The report that follows focuses on medicinal plants, broadly defined and selects a couple of examples to suggest in what very specific ways a few species and products in particular locations may be useful niche commodities for Eastern Cape Province entrepreneurs. It is not suggested that large numbers of producers and processors in the Eastern Cape Province will become involved in the collection, cultivation, trade and processing of medicinal plant products in the near term. However, as an example, improvements to the existing *Aloe ferox* harvesting systems can probably be made immediately, with benefits accruing to the harvesters, and other non-traditional crops such as *Pteronia incana* oil may be interesting to one or two enterprising commercial farmers looking for new production options.

Some Overarching Issues

The International Markets

The falling Rand makes the sale of plant materials and plant products on international markets particularly attractive at this time. Currently, the European Union is the largest single market for medicinal plants and herbal remedies in the world. The sales there of licensed herbals alone are around \$1.1 billion. The

¹ Wild crafted plants are plants harvested from the wild, i.e. not cultivated.

² Nutraceuticals is an American term covering a range of products. It is used by the industry to circumvent the ban on using “medicines, drugs or pharmaceuticals” when referring to unlicensed herbal remedies and dietary supplements.

use of plants in this way as licensed medicinals in Europe is regulated by both national and European regulations. In certain countries, like Germany, plant-based medicines can be prescribed by doctors; considering them as drugs increases both the demand and the retail price. Prescription plant products are strictly regulated through a series of monographs produced by the European Scientific Cooperative on Phytotherapy (ESCOP), the World Health Organization (WHO) and Pharmacopoeia, such as the European Pharmacopoeia. Unfortunately, the majority of plants in these monographs are European herbs, and getting new species onto the approved lists is a difficult and time-consuming process. Only two African plant products, *Aloe ferox* and *Harpagophytum procumbens* (devils claw) are currently listed in the Monographs on the Medicinal Use of Plant Drugs, published by ESCOP.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is responsible through TRAFFIC for regulating trade in threatened plant and animal products. *Aloe ferox*, Cape aloes is already a CITES Category II plant, and at CITES Conference of the Parties (COP) 11 in Nairobi, April 2000, the convention seriously considered including *Harpagophytum spp.* in the Category II list. (They finally asked the Plants Committee to prepare a report.) A category II listing means that the convention considers a plant potentially threatened and so a permit would be needed to export it. In other cases, and other countries, this CITES permit has been used more to extract “fees” from the exporter than to actually control the export. There is a lot of internal discussion and some agreement that the current implementation of CITES with respect to medicinal plants is far from satisfactory.

The international trade in medicinal and aromatic plants is huge, with annual global market imports of 440,000 tons in 1996 with a value of \$1.3 billion. The European Union is the world’s largest importer of crude medicinal plants, at around 100,000 tons annually, valued at \$250 million, which is about twice the tonnage of crude medicinal plants that the US imports. Germany (38%), France (17%) and Italy (9%) are the major importers; they are also the major herbal medicine manufacturers in Europe. France and Spain are also significant producers of medicinal plants, followed by Germany and Austria. Of the most important (in terms of dollar volume) plants sold in Europe, the only one from Africa that has a significant sales volume (\$105 million) is Pygeum bark.

Apart from licensed herbals, the total EU market for herbal remedies, dietary supplements and functional foods³ probably exceeds \$7.5 billion. In Europe the market for dietary supplements⁴ is a growing one, with an estimated \$1.3 billion in sales, mainly in Germany (\$517 million), France (\$332 million) and the UK (\$289 million). In America, there is a less restrictive attitude towards plant-based

³ Functional foods are not dietary supplements, but foods or beverages taken as part of the normal diet that affect beneficially one or more functions in the body.

⁴ Dietary supplements are not considered medicines, but health foods. With vitamins and minerals they are a major component of the over-the-counter (OTC) market.

medicines, so the U.S. Food and Drug Administration (FDA) regulates the majority of medicinal herbs as dietary supplements. That market in the USA is approximately \$670 million and has been growing at a high rate until recently, when there have been some signs of oversupply and of demand slowing down. Unfortunately there is little current awareness of, and hence a lack of widespread demand for, traditional African plants in the U.S. market, so the percentage of the total market supplied by African species is limited.

The South African Market

The local market for medicinal plant products is diverse and quite large. It can be divided into an upmarket demand for European herbal products, some produced locally, others imported; another market for traditional products used by the white population, mainly manufactured locally; and the large demand for traditional products by the black population. At the Cape Town conference Myles Mander of the Institute of Natural Resources, who has been studying the Durban market in traditional medicinals, estimated that in that market alone 1,500 ton of products with a value of 21 million Rand are traded. In KwaZulu Natal as a whole, 4,300 tons with a value of 61 million Rand are traded. These raw materials, when mixed, processed and prescribed, are probably worth 350 million Rand⁵. Mander's estimate for the South African market in traditional medicines is 19,500 tons, with a raw product value of 270 million Rand and a processed value of 2 billion Rand.

There are an estimated 200,000 traditional healers in South Africa processing and prescribing local plants, and up to 450,000 in the SADC region. One problem about expanding sales from the local market to the regional SADC market is that the species used are frequently different. On the local South African market, expansion of a plant medicine from the "muti" market to a wider, more commercial use is restricted by the actions of the South African Medicines' Control Council (MCC). To date the MCC has taken a fairly restrictive view of plant-based medicines and traditional healers, unlike other African countries where local medicines are increasingly seen as a low-priced alternative to expensive western medicine, and healers are seen as playing an essential role as part of the national health service.

Another specialized market for plant products in South Africa is the fragrance and flavor market. There is a well-developed chemical and consumer manufacturing industry demanding fragrances, and an equally well developed food processing industry demanding flavors. Fragrance sales in South Africa are estimated to be worth \$50 million annually. For example there is an estimated demand for 180 tons of citronella-type fragrances for use in laundry soap. Unfortunately, the comparatively high cost of citronella oil means that the local manufacturers are

⁵ For comparison, KZN's maize harvest is worth about 180 million Rand annually.

using synthetics rather than essential oil. But there is a sizable local industry using fragrances. Among the multinationals, Unilever and Colgate have manufacturing units, and all players are searching for cost-saving measures as premium product sales fall. There is an indigenous aromatic chemicals and essential oil industry, both locally owned enterprises and joint ventures with international houses. The annual market is probably worth around 430 million Rand, and exports of flavors are valued at around 90 million Rand annually. Much of the ingredients for the locally produced flavors are still imported. Soft beverages, confectionary, snacks and savories are the major users of flavors.

The Various Constraints to Developing some of these Potential Markets

The international price cycles of many of these plants are erratic and change from month to month. Another complication is that prices are often single quotes for a particular client, product and quality. Supply and demand shift and the competition is continually changing as new areas are harvested or come into production. An example is the recent expansion of the harvests of *Prunus Africana* in Bioka, Equatorial Guinea. For species under cultivation, oversupply may occur as they become popular and the areas expand, driving the price down, e.g. *Echinacea* and *Hypericum*. Products may simply go in or out of fashion, driven by changes outside the plant medicinal market, e.g. demand for Yohimbe (*Pausinystalia*) when Viagra was released or a report suggesting that a plant has been found to have new side effects or complications.

Marketing anything from South Africa internationally is difficult and expensive, and the medicinal plant industry is full of complicated market channels and multiple middlemen. The industry is also full of tales about shipments sent overseas and then rejected for quality reasons, or analyses done by European labs that determined a low proportion of active ingredient and led to the contract price being downgraded. The upside of the narrow marketing channels is that once personal relationships are finally established with a buyer close to the point of use they can be built on and usually persist through market cycles. The South African Department of Trade and Industry has a Primary Export Marketing Research Scheme (PMR) that has funds for the first marketing trip to a new market. But this one-off contribution does not help with the issues of follow-up visits, the costs of international lawyers when there is a contract dispute, or the need for accredited labs to analyze locally before shipment.

There is also an economy of scale issue in these crops, not only in terms of sufficient production to pay the investment costs for processing or extraction equipment, but also the need to produce enough volume locally to get and retain market attention. A specific example was seen in the Eastern Cape Province where a small amount of *Tagetes minuata* oil was reported as not being sold until the larger suppliers had run out of stocks to sell. Ideally, a producer needs a

number of different products spread out across market cycles and throughout the year.

From the purchaser's side they are looking for consistent quality, reliability and high content of the desired compounds. Purchases in the European market are more and more being linked to the Good Agriculture Practices (GAP) regulations for production and Good Manufacturing Practices (GMP) regulations for processed products. Good Agricultural Practices codes cover the growing and primary processing of all plants traded and used in the European Union.

Under GAP, seeds or plant materials need to be 100% traceable, which means that they have to be identified botanically as to variety/cultivars and specific source. Throughout the whole production process (cultivation, harvest, drying, packaging) there has to be documented processes and procedures in place to control the entry of any other plant material, especially genetically modified organisms (GMOs). Cultivation cannot be done in soils contaminated by sewage sludge, heavy metals, human faeces, pesticides, etc. Only trained and certified operators can apply crop approved chemicals⁶ in the authorized way. Good records of the brand, quantity and batch number of any pesticide used need to be kept. Similar sets of rules cover the various harvest and post-harvest operations.

Good Manufacturing Practices (GMP) is a similar code regulating quality management, personnel, premises, equipment and documentation, etc. for processing facilities. All of these regulations and codes mean that in the foreseeable future most agricultural export activities to Europe will need skilled management at the level of a medium-to-difficult horticultural export crop, like cut flowers or French beans, together with additional capital investment.

With the need for a significant area of production, (e.g. 20 ha. minimum for essential oil production; or much larger areas for sustainable wild harvesting), the options for cultivation of medicinals in Eastern Cape Province are broadly limited to commercial farmers. This means either a nucleus plantation and outgrower scheme, where a commercial farmer supplies technical assistance and marketing, or organized producer/marketing cooperatives of small producers. Both of these require capital investment for technology and market development, and production capital for cash flow and management. Within the broad models there are a number of variations possible depending on the particular crop.

The "simplest" option is something like a basic *Aloe ferox* gel production operation, where wild harvesting occurs and there is minimal processing before sale to a processor/broker/exporter. But even this option requires a significant cash flow for paying harvesters and for transport costs and packing materials. Further refinements include gum resin production, where the exuded juice is

⁶ This is a particular problem with minor crops where no pesticides are registered for specific use and only general purposes chemicals can be used.

heated to evaporate off water and allowed to cool to form a crystalline-like lump. Another value-added option is dried and ground leaf powder. The investment increases with the complexity of product, but still remains comparatively small. Sales of any of these products at the wholesale or retail level overseas need significant investment in packaging and presentation. *Tagetes minuta*, a weed introduced into South Africa represents an example of the next stage or level of processing. After the initial capital investment in a distillation apparatus, wild harvesting can supply the plant raw material. The still can be mobile or fixed, and the operation could potentially expand into a nucleus plantation cultivated to supply a portion of the total requirements to ensure consistency of supply, with outgrowers encouraged to plant a portion of their land to supply additional materials to the still.

Whatever species is chosen as a target for AGRILINK activities, a range of technical information is required. Fortunately there is already a wide variety of technical information on medicinal crops available within the Agricultural Research Council (ARC) and organizations such as the South African New Crops Research Association (SANCR) and the Centre for Scientific and Industrial Research (CSIR). With the privatization of these government entities they need to generate some returns to their advice, which means they may have a tendency in the future to work with the larger commercial growers or they may ask for some kind of profit-sharing stake in any detailed new research project.

What is not so easily available to any new farmers to the medicinal plant industry is specific detailed technical information about certain parts of the production and marketing process, such as variability in plant constituents or sources of elite plant material. Up-to-date detailed information on the marketing chain, product prices, changes in supply and demand, etc. may also be lacking as individual entrepreneurs usually hold this knowledge. It may therefore be better for AGRILINK to focus its work initially on experienced producers, helping them improve their business plan, their access to finance, and their production and processing operations. Alternatively, AGRILINK could concentrate on linking inexperienced producers and marketers to established producer and buyers looking to expand their operations. This would apply particularly to those producers and buyers willing to help smaller operations get started by providing technical help and advice and supplying access to markets and processing equipment such as a still or a grinder.

If there is sufficient volume of production and it can be spread across seasons to produce a return on capital investment, value-added processing at first glance seems like an attractive and viable option. Some of the things that have to be taken into account before value-added processing is encouraged by AGRILINK are the amount of capital required, the suitability of the site for the particular product, and the entrepreneur's ability to manage, to deal with risk and to survive a market downturn. There is marked variability in demand as plants go in or out of fashion, as new competitive sources of supply enter the market, new uses are

found, or there are negative reports about side effects, harmful pollutants in imported product from elsewhere⁷, etc.

Even a large-scale commercial farmer in Eastern Cape Province would be wise to diversify his production base, not putting more than a small percentage of his total energy and investment into the specialized plant product markets. For the smaller grower the risk is comparatively higher. If the narrow market for a plant fails or falls, he usually cannot sell it locally or eat it, so he must have a fall back for his food supply. For everyone involved in the system a failure to sell a product that has had value-added means a larger loss than if it had been made ready for export with minimal processing. The various markets for medicinals are all very competitive. It is not only resource poor Eastern Cape Province farmers that are looking for new crop opportunities; other farmers in South Africa, the region and worldwide are also looking very hard for commodities with high margins and high growth.

The size of the potential capital investment required obviously varies with the type of processing needed and with the facilities already available, such as land, electricity and buildings suitable for adaptation. Fresh plant material can be sold fresh, or extracted, juiced, or dried, ground, sieved and mixed. The ground product can itself be extracted using a range of liquids from water and alcohol to hexane, at a variety of temperatures, or distilled, dried or powdered.

Drying requires little more than racks, shade/rain protection for sun-dried plant parts, or barrels and firewood for reduction of a liquid sap. Total cost is a few hundred to thousand dollars depending on how elaborate and extensive the structures are. Alcoholic tinctures are produced by adding chopped dried materials to mixtures of water and alcohol to extract the active compounds. The alcohol may or may not be concentrated or evaporated off after extraction. Non-alcoholic tinctures have always been used in baby products, but there is a growing move towards using just water extracts as concerns rise about solvents. Drying and bottling equipment, plus some simple laboratory equipment for tinctures may cost anything from \$10-50,000 depending on its sophistication. An industrial-grade solvent extraction plant, equipped to produce standardized extracts can cost between \$200-\$500,000. If the extract produced is to be further processed by spray drying afterwards, another \$200-250,000 can be needed. At the top end, a sophisticated plant with HPLC and GLC laboratory equipment and carbon dioxide drying facilities can cost from \$2.5 to \$5 million.

Another obstacle to the rapid production of a particular plant product is both the source and the quantity of planting material available. The right material is rarely available immediately, so selection and bulking up has to be done. With the

⁷ At first glance a report about polluted product from another supplier seems like an opportunity to enter or expand in that market replacing their supply. However what is more likely to happen is that polluted product, such as "dirty" guta kola found to have heavy metal pollution, damages or even destroys the total demand for that product no matter where it originates.

consequent time lag between the identification of an opportunity and production in quantity, boom and bust cycles are common and average margins for these crops can be around the same as conventional crops unless the price cycle is entered and left at the right time. The market price is also often linked to the analysis of specific marker compounds, which may vary greatly with time of harvest, clones, post harvest handling, etc.

Within the worldwide market, the ultimate buyers available for specialized plant products are becoming fewer and fewer as companies consolidate and grow. An informal cartel may be encountered as the few companies that are using a particular plant product are already interrelated in their other businesses and may meet regularly to discuss the market for a particular commodity, their sources, etc.

There is a range of ecological possibilities in Eastern Cape Province so many, medicinal plant products can be produced, but the specific species chosen has to be grown in the right zone to ensure maximum production. Not all of the plants are amenable to intensive production. They may do better as weeds in fields or pastures, but this obviously changes the production system greatly, increasing the risk of loss of control, changing the logistical concerns, the planting costs, the potential variability in production etc. The species, site, farmer and market all have to be considered when making a decision.

The section that follows describes some specific possibilities in Eastern Cape Province for medicinal plant production and recommendations for AGRILINK activities. Two appendices follow it. The first appendix contains some information on potential medicinal species based largely on Dr Cobus Coetzee's list of indigenous medicinal plants used in South Africa⁸. The information contained in the list was compiled from the author's library, files and other sources. The main written sources of this detailed information are shown in the reference list. The Commonwealth Secretariat conference and the author's subsequent travel around South Africa also generated a list of contacts, companies and references that are included in the second appendix.

⁸ Coetzee, C., E. Jefthas, and E. Reinten. 1999. Indigenous plant genetic resources of South Africa. p. 160–163. In: J. Janick (ed.), *Perspectives on new crops and new uses*. ASHS Press, Alexandria, VA.

Specific recommendations for AGRILINK activities in Eastern Cape Province

Plants for the local medicinal (muti) markets.

Wild Harvested

A primary consideration is the long-term sustainability of the harvest. There is grave concern that mining and over-exploitation of the common resource base leading to scarcity is almost inevitable. Potential activities include development of harvesting associations controlling the resource in a particular area or working out agreements between harvesters and government institutions such as the Forestry Department. The Institute of Natural Resources is working in this area.

This is not seen as a suitable area for AGRILINK intervention at this time.⁹

Cultivation for the muti markets

Cunningham (1990) and Mander (2000) have studied the informal medicinal plant market. The main issues and the difficulties listed in this section draw heavily on their work. The main obstacle is the low prices paid for traditional medicinal plants by traders and herbalists. Cultivation has to compete with wild harvested material, and so prices have to increase with scarcity before cultivation becomes viable. *Siphonochilus* became extinct in KwaZulu Natal in 1996 and is now selling for 400 Rand a kilo on the Durban market. In 1990, Cunningham listed some South African species that are either high priced and/or fast growing and thus potentially candidates for cultivation. Cunningham's list follows.

Species in sufficient demand and scarce enough to merit cultivation

Alepidea amatymbica (Apiaceae)
Asclepias cucullata (Asclepiadaceae)
Begonia homonymma (Begoniaceae)
Boweia volubilis (Liliaceae)
Dianthus zeyheri (Illecebraceae)
Haworthia limifolia (Liliaceae)
Pimpinella caffra (Apiaceae)
Plectranthus grillatus (Lamiaceae)
Siphonochilus aethiopicus (Zingiberaceae)

⁹ *Aloe ferox* is wild harvested, but sold primarily on the international markets.

Warburgia salutaris (Canellaceae)

The success of cultivation also depends on the attitude of traditional healers to the material. Cultivated material is often seen as inferior to wild harvested material and lacking in power.

Other considerations around cultivating wild species include: availability of starting material, legal considerations, and the availability of technical information on production, harvesting and processing. The ARC and the Universities have been working with some of these species. For example *Siphonochilus aethiopus* has been propagated using tissue culture. Cultivation is occurring but the demand is for small amounts, spread in time and space.

Low prices are a continual problem. For example *Hypoxis hemerocallidea*, African potato, is very much in demand at the moment, for its putative effect on AIDs, and wild populations in the region are reported to be fast disappearing, but even so an eight-year old bulb on the Durban market is still only selling for 5 Rand¹⁰.

There has been a good deal of work locally on the issue of cultivation for the muti markets. If a local entrepreneur or community shows interest in this area, and comes to AGRILINK to request assistance, then the project staff should contact those working in this field in South Africa and work with them to determine the viability of the specific project proposed. But it is not seen as an area to aggressively pursue without a clear local interest first.

Plants for the local formal market and the international markets

Wild Harvested

Currently at least two species are being wild harvested on a large scale and sold on the international markets. -- *Aloe ferox* and *Harpagophytum procumbens*. The latter is coming under increasing scrutiny as wild populations decline. It will most likely become a CITES II listed plant, as Germany, the main importer is pushing for listing. Tissue culture and cultivation is underway. Its main habitat area is in the low rainfall (100-200 mm/year) areas of the Kalahari. Apparently, much of the increasingly controversial South African trade in the plant originates in Namibia. **Fortunately, *H.procumbens* is not a common plant in Eastern Cape Province, so it is not a good candidate for AGRILINK interventions.**

Aloe ferox, however, occurs widely and has been exploited for a long time in Eastern Cape Province. It is used locally, as a tonic and a laxative, by companies such as Lennon in Port Elizabeth and ?? in Albertina. It is also used

¹⁰ Muller, 2000

in Lewensessens, produced by GR in Atlantis, and in Schweiden bitters. The dried sap, cape aloes, is also exported and traded on the international market. AGRILINK is already working with a local company in Seymour, Eastern Cape Province, helping them to draw up a business plan for expansion into value-added products and improved processing.

The aloe plant is locally abundant and is being wild harvested. It is suggested that a long-term approach to sustainable harvesting be taught to the harvesters, and that the company be assisted to develop a "green" label. A list of standards for harvesting, similar to the Soil Association's draft on organic wild crafting, should be drawn up and adhered to. Records should be kept of all operations to ensure the good environmental management of the operation. A quality management and sustainable harvest plan for all the harvest locations is needed. Currently a maximum of eight leaves per plant is seen as the upper limit to sustainable exploitation, obviously the success of this system depends on control over the harvest and rotation of the harvest areas.

Samples of each batch harvested need to be taken, retained and recorded to ensure traceability. A simple laboratory can be set up to ensure that product is maintained at a consistently high standard. Since contract prices are usually linked to barbaloin content, on-site testing will not only provide a check on the overseas analysis, but also allow the shifts in barbaloin content to be monitored¹¹. The content of Pb and Cd needs to be monitored for international trade, and Se accumulation is also likely to be a potential issue on the drier sites.

There is an established methodology for developing a green harvested product. It includes the following "rules".¹²

- Start with what is already on the market;
- Diversify production and reduce dependence on a few products;
- Diversify the markets;
- Add value locally;
- Capture value that is added further from the source;
- Volume is required to compete on the world markets;
- Control of a large percentage of the market share, if possible;
- Make long term sustainable profits, not windfall profits;
- Certification of environmental sustainability is key.

Agrilink staff should work with Seymour Aloe Distributors to develop their harvesting and processing systems in a sustainable fashion and assist them to market locally and internationally under a "green" label.

¹¹ Seasonal and clonal differences in barbaloin content from 5-40% have been recorded.

Information on any local area differences can be used to fine tune the area management plan.

¹² See Clay, 1992 and Laird 2000. Also Greenham, unpublished, green labeling in timbers, and the Soil Association's rules for wild crafting.

Cultivation for the local formal and international markets

Essential oils such as buchu, artemisia, cape may, Pteronia, Tagetes and others are all being produced locally. There is significant expertise within the South African research and producing community. AGRILINK staff should work with local entrepreneurs, the ARC and others to develop these products. These products are frequently found in the drier areas of the province that are less well suited to other commodities.

Appendix A

Details on some of the Medicinal plants used/grown in South Africa.

Agathosma

Agathosma (Agathos - good; osme - scent) is a genus in the Rutaceae (citrus family) consisting of about 140 endemic South African species. They are aromatic Erica-like erect woody shrubs, 18-24 inches tall, some cultivated as ornamental flowers. Leaves are usually very small, flat or three angled. At least three species in South Africa, A. betulina, A.ovata and A. crenulata are used medicinally. According to Uphof A. apiculata E. Meyer leaves are a source of essential oil, used as a stomachic, a diaphoretic and an antipyretic.

Agathosma betulina (Bergius) Pill. (Syn. *Barosma betulina* (Thunb.) Bartl. And Wendle, (Rutaceae).

Names: A. betulina Buchu, Bucco, Boegoe.

Occurrence: Uphof talks of A. apiculata E. Meyer, found from Winterhoeks-Mossel Bay to Port Elizabeth. The genus is South African, found especially in the South-Western Cape. A. ovata is found in former Transkei and along the coast region of Kwa-Zulu Natal and Eastern province.

Description:

Habit: Perennial herb. The stems, may be upright or spreading, densely covered with tiny, narrow leaves, often rolled at the edges. A.betulina is up to 3 ft. tall.

Leaves: Usually small, narrow, often rolled at edges. A.betulina has larger leaves, up to 1 inch long. Pale green, less than ½ inch wide, leathery and glossy. Blunt, strongly curved tips and finely toothed margins, with round oil glands scattered over the surface. Strong aroma of citrus.

Flowers: Small flowers, (always less than ½ in. in diameter), usually massed in umbels, mainly at the branch tips, often in the leaf axils. Flower colors range through white to red to mauve and sometimes yellow. A.betulina has pink flowers borne singly at the end of fine branchlets. Pentamerous.

Fruits: Brown

Uses: The dried leaves of A.betulina have been widely used for medicine for a long time in its native Western Cape Province. Used by Hottentots, as tea and as a local application for bruises. Source of short buchu; diuretic, carminative. Traded internationally. Artificial blackcurrant flavoring. Buchu leaf oil is used in berry, fruit, chocolate, mint and spice flavorings for beverages, ice cream, ices, candy, baked goods, liquors and condiments. Has been used as a urinary antiseptic and a mild diuretic. Oil sold in capsules in South Africa by Vital Health Foods as a slimming aid. No known toxicity.

Cultivation: Plant in full sun with a gritty, humus-enriched, well drained slightly acid soil. Hardiness varies with species, most tolerate slight to moderate frosts. Propagate from seed or tip cuttings.

Opportunities: Contains an essential oil, buchu camphor or diosphenol; also diosmin, an alkaloid.

Recommendation: There is currently a ban on importation of buchu into the United States, and demand for the plant is slight. None of the A-SNAPP correspondants are buying buchu. A certified cultivated supply may be able to pique interest. HRF is investigating the import ban to determine if exceptions are possible for cultivated material. At least 200 ha? of buchu are cultivated in South Africa.

Related Species: A.ovata, false buchu, basterbogoe, umahesaka-omhlope, used traditionally in KZN for nervous complaints.

Bibliography: Journal of South African Botany, 16(1950)55. Agricultural Journal of the University of South Africa (6:80, 1913).

Aloe

Aloe is a genus in the ASPHODELACEAE. Of 363 species, approximately 150-180 species occur in South Africa, especially in the Karroo. Many of the species hybridize easily.

Aloe ferox Miller, (Syn. *A. horrida* Haw.)

Names: Aloe, Bitter Aloe, Bitteraalwyn, Cape Aloe, Tap Aloe

Rhodesian Number: Not found there

South African Number: 29,2

Occurrence: Eastern Cape. From East of Cape Town through Port Elizabeth up to Lesotho. Occurs in bush scrub and on open hill slopes, habitat varies across its wide range. Frost hardy. Planted around cattle kraals.

Description: Succulent perennial, 2 to 3 m, may be up to 5 m, the single stem densely bearded with old dry leaves.

Habit: Usually shrubby or arborescent xerophyte evergreen.

Stem: The single woody trunk may be up to 15 ft. tall.

Leaves: Lance shaped, up to 3 ft. long, non fibrous. Form a compact rosette, dull bluish green edged with stout brownish-red teeth. Thick epidermis, often waxy, stomata in pits. Leaf surfaces mainly smooth, few to many scattered spines (*ferox*). Used as fodder in drought times.

Flowers: Flower heads branched, one stalk per rosette; flowers in long, dense, erect spikes, unicolored orange-red, scarlet, (occasionally white) Flowers May to October. The tips of the inner perianth lobes are brown, (*A.candelabrum* is white tipped). Flowers produce copious nectar, open progressively from the base.

Fruits: Three angled capsules.

Uses: Cape aloes, a laxative is extracted from the cut leaves. The greenish black juice is evaporated. Leaves can also be made into jam, dried and burnt to

repel insects, or sun dried and pickled in lime juice. Internationally traded. Active principal anthraquinone derivatives and other phenolics, eg. aloin. Two 15 year old boys in South Africa who had consumed an over-large amount of honey by sucking out the nectar-rich flowers of *Aloe ferox* were observed to be suffering from a curare like paralysis. Sold in formulas in South Africa by a number of companies including GR Pharmaceuticals and Pharma Nature. Cultivation: Warm, dry climate, well drained soil, frost hardy when established. Full sun. Propagation by offsets or stem cuttings. Mealybug can be a problem. Opportunities: Recommendation: Develop one or two “green” producers in Eastern Cape Province, using sustainable harvesting techniques. Improve quality. Related Species: Numerous. A. vera is used in skin products, shampooing and for burns. Aloe vera is 99.5% water, rest 20 amino acids and carbohydrates. AMA claims ineffective in cosmetics. Also used in bitters, vermouth and spice flavorings. Bibliography: Excelsa 9(1980)57.

Artemesia

Artemesia is a genus in the ASTERACEAE. 280-300 species in the northern hemisphere, South Africa and South America.

Artemisia afra Jacq. ex Willd.

Names: Wormwood

Occurrence: Occurs in Northern and Luapula provinces in Zambia.

Description:

Habit: Shrub

Bark:

Leaves:

Flowers: small, inconspicuous, wind fertilized.

Fruits:

Uses: Dried leaves and flowering tops used medicinally, as a stimulant, stomachic, tonic, antihelmintic. Oil of *A. absinthium* is narcotic, and can be toxic.

Wood:

Cultivation: Common on arid soils, eg. western USA sage brush, the steepes.

Open sunny situation with light, well drained soil. Prune back in spring to stimulate growth. Propagate from cuttings in summer and by division in spring.

Move during winter.

Opportunities:

Recommendation:

Related Species: A. abrotanum (old man, southernwood) and others are cultivated ornamentals. Wormwood (*A. absinthium*) is used for vermouth, bitters and absinthe. A. dracunculus is tarragon. *A. vulgaris*, mugwort, a European species was used in the past for flavoring beer.

Balanites

Balanites is a genus in the BALANITACEAE, family name, Green-thorn consisting of 3/4? (25) species, three of which are trees. Found in Egypt, tropical Africa, Ethiopia, and dry regions of Pakistan and India.

***Balanites maughamii* Sprague**

Names: Torchwood, Fakkelhout, Y thorned torchwood (Zimb.) Species, # 251
Balanites maughamii, Old name, Green Thorn, Preferred name Y-thorned
Torchwood / Green-thorn Torchwood Species. Rhod. # 381. E.Africa, menduro.

Occurrence: B. *maughamii* found in Mozambique, Southern Province, Zambia, and Northern Zimbabwe. Eastern Transvaal. Dry open bush, woodland, sand forest and also along river banks, near springs and round pans.

Description: A medium to tall deciduous tree, 10 to 20 m in height.

Habit: Forked thorns, (cf. *Carissa bispinosa*) and paired leaflets distinctive.

Bark: Grey and smooth, trunk fluted in large specimens, young branches zigzag and with forked spines, one side longer than the other.

Leaves: Two leaflets, oval to almost round, 2.5 to 6 x 2.2 to 5.7 cm, dark grey-green, velvety hairs when young, persisting on underside to maturity, leathery, apex rounded, base broadly tapering, margin entire, petiole and petiolules short and densely velvety.

Flowers: Small, up to 2 cm in diameter, yellowish-green, petals with dense hairs on the outer surface, inconspicuous, produced in small, dense, 3 to 7 flowered umbel like cymes. Flower bearing branches almost unarmed. (September to October).

Fruits: Resemble large dates. 4 to 6 x 2 to 3 cm, yellowish when mature, 5 grooved from the base to the tip, a thin fleshy layer surrounding the hard kernel. November to January. Edible, but not sought after.

Uses: The nuts are a source of a clear oil similar to olive oil. Good quality, tasteless and colorless. Burns with a bright flame, kernels used as torches.

Lethal to snails, placed in water and left to soak. Concentrations of 1:100,000 to 1:250,000 of pulp to water will kill bilharzias miracidia and cercariae, snails, tadpoles and some fish. Non toxic to man and mosquito larvae. Emetic prepared from bark decoction. Bath in water infused with bark is stimulating.

Wood: Hard, good quality, used for tool handles and for gun stocks. See Z. list.

Cultivation: In Kenya, *B.aegyptiaca* seeds store well for a year, if fruit removed and kept clean and dry. Soak overnight and then sow vertically, stem end down, germinates in 1-4 weeks, 12 weeks in nursery.

Opportunities:

Recommendation:

Related Species: *B. orbicularis* tree found in Somalia, source of hanjigoad gum resin. *B. roxburghii*, small tree in India and Pakistan, seeds source of Zachun oil. *B. aegyptiaca*, edible fruits, seeds source of betu oil, leaves eaten, roots and bark used as purgative and vermifuge, bark and fruit also used as a fishing poison. South African species, # 252.1 *Balanites aegyptiaca*, Old name, Simple-thorned Torchwood, # 252 *Balanites pedicellaris*, Old name, Small Green Thorn, Preferred name Small Torchwood

Bersama

Bersama, 2 spp. 1 very polymorphic, or c. 20 species in the MELIANTHACEAE, found in tropical and southern Africa.

Bersama tysoniana Oliver

Names: White ash, common bersama, gewone witessenhout, SA # 443

Occurrence: From KwaZulu up through Transvaal to Zimbabwe border. Occurs at margins of evergreen forest and in bush clumps.

Description: A shrub, or a small to medium sized tree, 3 to 10 m high.

Habit: Densely foliated, leaves strong, heavy, tending to curve down, often slightly flushed with maroon to brown. Flowers and fruits in firm, upright racemes, bracts conspicuous.

Bark: Grey to brownish, thick, rough, corrugated.

Leaves: Rachis not winged, 4 to 5 pairs of opposite leaflets, plus a terminal, leaflets oblanceolate or oblong to elliptic, up to 6 x 3 cm., without hairs on either surface, midrib prominent below; apex and base rounded, margin entire, or finely toothed over the upper half, petiolate.

Flowers: Greenish-white to cream, with shaggy hairs, in dense, upright, spike-like racemes, up to 17 x 2.5 cm (August to December).

Fruits: A spherical capsule, about 2.5 cm in diameter, brown when mature, covered in woody protuberances, splits into four valves, revealing the reddish seeds, with a yellow, waxy, cup-shaped aril at the base. (February to August).

Uses: Bark used by diviners together with saponin rich species such as *Helinus integrifolius* in an *ubulawu* mix to enable them to interpret dreams clearly.

Wood:

Cultivation:

Opportunities:

Recommendation:

Related Species

Boophone

Boophone is a genus in the AMARYLLIDACEAE. Six species from southern and eastern Africa.

Boophone disticha (Linne.f.) Herbert. Amaryllidaceae

Names: Fan-leaved Boophone, Poison Bulb, Tumbleweed, Tumblehead, Fire ball, Sore-eye; (Gifbol, Perdespook, Seerooglelie, Afrikaans); (ibhade, bate, inkotha, Zulu); (iswadi, incotho, inkwadi, Xhosa); (kxutsana-ya-naha, leshoma, lesoma, motlatsisa, South Sotho); incumbe, siphahluka, Swazi).

Occurrence: Found in woodland and along dambo margins and in dry grassland, often in rocky places. Up to 2450 m. Rocky grassland, bush-land and clear forests. Widespread. South Africa, Namibia, Botswana, Lesotho, Mozambique, Angola, Zimbabwe, Zambia, Malawi, Tanzania, Kenya, Uganda, Burundi, South Congo.

Description: A deciduous herb with a large bulb, which annually produces a fan of leaves and a dense umbel of dull red flowers when leafless. Up to 45 cm high. The fruiting inflorescence can break away and roll over the ground, dispersing the seeds. A thick covering of papery membranous scales sheath the bulb, which is ovoid 1—30 cm. thick. The outer scales become wine-red to brownish, membranous papery and silky-shining, the inner ones are white and fleshy. In the fall?, a flowering stem is produced, topped by a long stemmed umbel of narrow petalled flowers. As the flowers wither, a fan of long narrow leaves are produced by the bulb. Normal size of the bulb is 17-22 cm high, 15 cm wide and can be up to 1.4 kg in weight.

Habit: Bulbous perennial, found on alkaline soils.

Leaves: Long and narrow, fan like, after flower stalk. Set in one plane, but opposite each other (disticha). Blue-grey-green, 8 to 16, erect, distichous, linear, coriaceous, 30-50 x 2-4(5) cm., more or less spirally arranged, gradually narrowing to the apex. Margins flat or wavy. The leaves are arranged like an upright fan in two rows.

Flowers: Emerge at beginning of rains, distinctive stalk with ball of scarlet flowers. Fire induces flowering. Very numerous (75-100) in a dense spherical umbel up to 15 cm in diameter, on a strong flattened peduncle of 5-10 cm long, 3-5 cm wide sweetly scented flowers with long, stiff pedicels, 5-8 cm long, pink to red, with two opposite spatha valves which are triangular, acuminate and up to 8 cm long; corolla 3 cm long, limb 6-cleft, lobes linear, spreading-recurved; 6 stamens, inserted at throat of perianth, stiff and a little longer than the segments. After flowering the pedicels increase in length to 15-30 cm. And become rigid, straight and spread, so the whole seed head becomes a sphere, 40 cm up to 60 cm in diameter, which breaks off when dry and rolls along in the wind.

Fruits: Borne on stalklets about 20 cm long in July-October. Three cornered capsules, drop seeds as they roll along. Turbinate, irregularly dehiscent, 1.5-3 x 1-1.5 cm. Seeds 3.5 mm in diameter.

Uses: Bulb contains at least eleven alkaloids unique to this family, including lycorine and buphanine, causes vomiting and gastroenteritis. Concentrated bulb juice alone or mixed with *Euphorbia* latex was/is used as arrow poison. The alkaloids are neurotoxins of high to medium toxicity. At least 30 deaths a year reported from the rural areas of South Africa, especially from use as an enema. Death comes from respiratory arrest, sometimes within half an hour. Leaves apparently non-poisonous. Contains nerbowdine/=haemanthine??. Extensively used in South Africa, Namibia, Zimbabwe and Mozambique. Silky outer scales used as a wound dressing, skin diseases and for rheumatic pain. Bulb extract used for headaches, chest and abdominal pain. Pains, wounds and narcotic.

Wood:

Cultivation: Needs a free-draining soil, and dry summers, resent disturbance and may take several years to attain flowering. Not frost tolerant. Division is difficult. Grow from seed, sown uncovered on free draining potting mix. Some shade at first.

Opportunities: Occurs wild in Eastern Cape Province.

Recommendation:

Related Species

Bowiea

Bowiea is two species in the HYACINTHACEAE.

Bowiea volubilis Harv.

Names: Climbing lily, *Bowiea*; (Knoklimop, Afrikaans); (gibizisila, Swazi); (Umagaqana, Xhosa); (iguleni, ugibizisila, Zulu).

Occurrence: A xerophyte, with a large partly underground corm, found on low mountain sides in East and South Africa (Eastern Cape). In thickets, on forest margins, among rocks.

Description: Perennial succulent.

Habit: Deciduous climber. Bulb large, green up to 15 cm in diameter. Often on surface. Each year a much branched climbing stem emerges. The small leaves drop off quickly and the green stem photosynthesizes. 3 m, (12 ft) high, indefinite spread.

Leaves: Small linear leaves, 1/16 in. (2 mm.) long, 1 or 2 at base, rapidly dehiscent. Leaving branching, fleshy, bright green, much branched stems.

Flowers: Diurnal, star-shaped greenish white flowers, 3/8 in. (8 mm.) across borne in twisting, terminal panicles in spring and summer (Oct. to April). Stalks turn backwards.

Fruits: Brownish oval capsule c. 2.5 cm.

Uses: Spherical brown bulb, green when exposed to light. Bulb used as a purgative. Overdose can often be fatal. Fresh bulbs used for dropsy and

barrenness in women by Xhosa. Used extensively in traditional medicine to treat sore eyes, skin complaints, dropsy, headaches, barrenness and as a love charm. Cultivation: Ornamental. Minimum temperature 55F/13C. Easily grown from seed. Sow seed at 70C in early spring. Grow in sharply drained soil, full sun, with some midday shade. Support stems. Low humidity, soak thoroughly then allow to dry. Can be grown in containers.

Opportunities:

Recommendation:

Related or similar Species: *Schizobasis intricata*

Cassine

Cassine, 40-80 species in the CELASTRACEAE, from South Africa and Madagascar.

Cassine papillosa (Hochst.) Kuntze (Syn. *Elaeondron capense* Ecklon & Zeyher)

Names: Common saffronwood, Gewone saffraan

Occurrence: From Cape Town to Zimbabwe border. Found from sea level to 900 m. at margins of evergreen forest and in wooded valleys and ravines.

Description: A shrub or small tree, 4 to 5 m in ht., not infrequently to 10 m.

Habit:

Bark: Grey, smooth, very thin with a bright orange underbark which shows through in patches, dotted with prominent black lenticels, very bitter.

Leaves: Alternate or opposite. Opposite to sub-opposite, oblong to elliptic, 5 to 11 x 2 to 4 cm., leathery, dark green above, paler green below, or grey-green on both surfaces in younger leaves, clearly defined net-veining on both surfaces; apex tapering to broadly so; base tapering; margin hardened and with fine, often widely spaced teeth which are sharp tipped; petiole up to 10 mm long.

Flowers: Small, whitish or pale-green, on the current years shoots, in the axils or small bracts which soon fall; produced in few to many flowered compact heads about 8 mm in diameter. (Aug. to March, mainly Oct. to Nov.)

Fruits: Berry like, up to 2.5 cm long, ovoid, pale lemon yellow when mature, often wrinkled and encrusted (*papillosa*) May only mature with next seasons flowers.

Uses:

Wood: See Z. list.

Cultivation:

Opportunities:

Recommendation:

Related Species: C.crocea Presl yields saffron wood. C.buchananii leaves are very poisonous to livestock. Dyes and medicines.

Clivia

Clivia has four endemic South African species in the AMARYLLIDACEAE.

Clivia miniata Regel.

Names: Clivia, Bush lily, Fire lily, St. John's lily; (Boslelie. Afrikaans); (Ubuhlungu-bemamba, ubuhlungu-beyimba, umayime, Zulu).

Occurrence: Widely distributed in eastern South Africa, low-lying woodland, often by streams, especially along coastline.

Description: 18 inches (45-50 cm) in height, broad leaves, up to 3 inches wide

Habit: Evergreen stemless perennial, found on alkaline soils, in clumps and large colonies. In partial shade of forest and coastal bush, coast to midland.

Leaves: Thick strap like deep green leaves, to 24 in. (60 cm.) to 3 in (6.5 cm) wide, arise from short rhizomes with thick roots, and taper to a pointed tip.

Swollen overlapping leaf bases resemble bulb.

Flowers: Borne in dense umbels, terminating somewhat flattened stems. Up to 20 or 30 funnel or trumpet shaped, semi-pendant, orange to scarlet flowers, with yellow throats, partially fused into a tube, tepal lobes spreading. Sweetly scented. Up to 3 inches (7 cm) long in wild and cultivated forms. Flower stem to 45 cm.

Fruits: Deep red, fleshy, berry like, conspicuous fruits, 2 cm in diameter, persist until next flowering season.

Uses: Cultivated ornamental flower. Long lasting cut flower. Used in traditional medicine to treat fever and snakebite, ease childbirth and as a protective charm. All parts of *C. miniata* can cause mild stomach upset if ingested, and the sap may irritate the skin.

Cultivation: Commonly cultivated, many cultivars, including yellow and cream forms, and tulip like scarlet forms. Does well in a mild, frost-free climate. Shade or part-shade, friable well drained soil. Shallow rooted, so resent disturbance. Keep dry in winter. Propagate by seed, (slow to flower) or division. Minimum temperatures 50F/10C. *C. miniata* var. *citrina*, rare in wild, creamy yellow flowers, yellowish orange fruit, now available in nurseries.

Opportunities:

Recommendation:

Related Species: *C. caulescens* an epiphyte, *C. gardenii*, and *C. nobilis*.

Cryptocarya

Cryptocarya Seventy (200) tropical and sub-tropical species in the LAURACEAE

Cryptocarya latifolia Sond.

Names: Broad leaved quince, broad leaved laurel, breeblaarkweper

Occurrence: East and Southern Africa, Australia?. In South Africa found in evergreen forest around coast from Durban north to KwaZulu Natal.

Description: A large tree up to 20 m.

Habit:

Bark: Grey-brown to light brown, rather smooth, with fine vertical fissures and occasional horizontal ridges.

Leaves: Broadly oval or ovate, 5 to 10 x 2 to 4 cm, leathery, dark green and finely velvety above, greenish or cinnamon brown below, later becoming dull, bluish-green, hairs persisting on veins only. Three veined almost from the base, midrib branches near the apex, apex obscurely toothed, petiole short.

Flowers: Small, about 1.2 cm in diameter, in long slender, branched sprays, rather spidery in appearance, stalks and sepals have fine cinnamon hairs, petals white and slender (Sept. to November)

Fruits: Ntonga (nitronga) nuts. Spherical, about 2 cm in diameter, becoming black after shed. (January to March)

Uses: Fruit kernels contain a dark colored fat. Zulus grind bark, mix it with crocodile fat and use for chest complaints.

Wood: White and soft.

Cultivation:

Opportunities:

Recommendation:

Related Species: *C. moschata* fruits (Brazilian nutmegs) are used as a spice.

C. erythroxylon, *C. glaucescens* and *C. oblata* are Australian species used for wood. *C. glabella* poison walnut, Australia, touching bark can lead to hospitalization. *C. peumus* has edible fruits.

Curtisia

Curtisia, one South African species in the CORNACEAE.

Curtisia dentata (Burm.f.) C.A. Smith (Syn. *C. faginea* Ait)

Names: Assegai, assegai-wood, assegai tree, Cape lance wood, SA # 570, Rhod. # 819, mubotjo.

Occurrence: From Cape Town to Zimbabwe, and eastern Zimbabwe. Occurs over a wide range of altitudes, in evergreen forest, on grassy mountain slopes and as a small bushy tree in coastal scrub forest. Gave its name to Assegaibos in Western Cape Province.

Description: A medium to large tree, freq. 6 to 12 m in ht., up to 20 m. not uncommon. But exploitation in the past for its wood means fine specimens are rare.

Habit:

Bark: Brown and smooth in younger trees, dark brown and square fissured in older trees.

Leaves: Opposite, simple, oval, broadly elliptic to almost circular, 2.5 to 10 x 2.5 to 7.5 cm, usually 7 x 4 cm, leathery, the upper surface shiny dark green, without hairs and with conspicuous pale veins, the under surface light green with wooly hairs, and very prominent veins which are covered with short soft grey, rusty or brown hairs; the young leaves and the leaf buds are covered with dense wooly grey or rusty hairs; apex broadly tapering to rounded, finally abruptly sharply pointed; base broadly tapering to square, margin strongly and coarsely toothed, teeth often curved back or reflexed, petiole up to 1.5 cm long.

Flowers: Small, inconspicuous, cream, with all parts covered with light grey soft hairs, in branched terminal heads, or panicles, up to 12 cm long. Bisexual, all flower parts in fours, calyx joined to form a twisted tube, stamens alternating with the petals and equal to them in length, ovary four chambered (October to March)

Fruits: Almost spherical, fleshy, about 10 mm in diameter, four seeded, crowned with the remains of the persistent calyx, white at first, becoming red when mature. (Frequently sporadic, six to ten months after flowering, about May to October). Bitter, but sought after by birds, pigs, monkeys and baboons, who distribute them.

Uses: Bark used for tanning. Red coloured bark used for magical purposes. Use unknown and kept very secret.

Wood: Hard, assegai wood. Reddish, fine grained, hard, strong, elastic, tough and heavy. Not very durable, as it splits on seasoning, and heart wood is liable to rot. Takes good finish, used for furniture, tool handles, spokes and felloes.

Large specimens are rare. See Z. list.

Cultivation: Fast growing, but not easily propagated from seed, frost tender.

Frequently heavily infected, leaves by black fungus, flowers by galls, so little fruit may set.

Opportunities:

Recommendation:

Related Species

Dioscorea

Dioscorea; 600-850 plus species in the DIOSCOREACEAE, found in the tropics and sub-tropics. One genus, nineteen species in South Africa.

Dioscorea sylvatica (Kunth) Ecklon

Names: (Forest) Elephant's foot, Wild Yam; (Olifantsvoet, Skilpadknol, Afrikaans); (lunyawo-lwendlovu, Swazi); (ingwevu, intane, ufudu, ufudu lwehlathi, Zulu).

Occurrence: In scrub forest, coast to mountains, Eastern Cape to Central Africa.

Description: Slender climber, with a tuberous rootstock.

Habit: Twining annual stem up to 15 m high arises from a large tuber, 0.3 (1) m diameter, 12 cm thick, dark brown, corky, with reticulate markings, above ground or buried 25 cm deep.

Leaves: Alternate, heart shaped, 5-8 cm x 6 cm, net veined, lobed, narrowing to threadlike point, very variable.

Flowers: Racemose inflorescence. Dioecious flowers. Male yellowish green in spikes, 14 cm. Female, 9 cm in hanging spikes (November to April).

Fruits: Capsule or berry, 2.5 cm x 1.5 cm, yellowish-green edged reddish brown. Winged seeds.

Uses: Rootstock contains diosgenin, used in preparation of cortisone. Used traditionally to treat blood problems, chest complaints and also to treat cattle.

Cultivation: Frost tender, require good cultivation. Well drained soils, high in organic matter, compost dug in at planting. Plants should be staked. Propagate by seed, division, or by slicing small pieces, from upper part of tuber, containing dormant buds.

Opportunities:

Recommendation: Species threatened through exploitation.

Related Species: Many *Dioscorea* spp. are eaten as food, (yams), or in famine emergencies, or used for dyes, tanning or as fish poisons. *D.floribunda* contains 10% by weight of diosgenin, a precursor of cortisone.

Bibliography: D.G.Coursey "Yams", Longmans, 1967.

Eucomis

Eucomis Ten to fifteen species in the HYACINTHACEAE, found in tropical and southern Africa. About ten species in South Africa.

Eucomis autumnalis (Mill.) Chitt. (Syn. *E.undulata*)

Names: Wild pineapple, pineapple lily, common pineapple flower; (krulkop, wildepynappel, Afrikaans); (kxapumpu, South Sotho); (ubuhlungu, Xhosa); (umathunga, ukhokho, umakhandakansele, umakhondle, Zulu).

Occurrence: In damp grassland, coast to 2,450 m, Eastern Cape to Zimbabwe.

Description: Deciduous, bulbous perennial. Three sub-species.

Habit: 8-12 inches high, up to 24 inches (50 cm). Bulb up to 10 cm in diameter.

Leaves: Basal rosette of glossy, bulky foliage. Semi-erect, broadly strap shaped, light green leaves, 18 in. long, (15-55 cm x 4-13 cm) with wavy, undulating margins, tightly scalloped or toothed.

Flowers: Dense terminal spike (raceme) 2-6 in. long crowned by a tuft of 10-45 terminal bracts, resembling a pineapple. Small star shaped flowers, white, greenish white, to pale yellow-green, pendant, age to darker green. (Dec.–April)

Fruits:

Uses: Cultivated ornamentals. Popular garden plant. Xhosa boiled bulbs as poultice for rheumatism. Used traditionally for urinary and pulmonary ailments, fever and diseases of stock.

Cultivation: Marginally frost hardy, do best in warm-temperate climates, full sun, moist, but well drained soil. Water freely during active growth, but dry in dormant period. Propagate from seed or by division of bulbs in spring. Sow seed at 61F. Plant offsets or bulbs 8 in. deep.

Opportunities:

Recommendation:

Related Species: *E. comosa* garden plant, cut flower and used traditionally for rheumatism. *E. bicolor* used for colic,

Gunnera

Gunnera. Forty to forty-five species in temperate South America, Costa Rica, New Zealand, Tasmania, Malaysia, Polynesia and Africa. One in South Africa.

Gunnera perpensa L. Gunneraceae Wild rhubarb

Names: Wild Rhubarb, River pumpkin; (Wilderabarber, Afrikaans); (qobo, South Sotho); (uqobho, Swazi); (iphuzi lomlambo, uxobo, Xhosa); (imfeyesele, ugobho, uklenya, uxobo, Zulu).

Occurrence: Becoming rare. Found in moist habitats, marshy areas and along streams, coast to 2,400 m. Cape to Ethiopia.

Description: Robust, rhizomatous perennial herb, with pumpkin like leaves covered in short hairs. Up to 1 metre tall. Rhizome, 3 cm diameter, yellow flesh.

Habit: Perennial

Leaves: Tufted, large, (4-25 cm x 6-3.8 cm), like a pumpkin, up to 12 inches wide. Margins lobed, with small rough edged teeth, stalks 25-45 cm.

Flowers: Nodding spikes of tiny pinkish reddish-brown flowers 20 cm up to 3 foot, (1 m) tall. Male flowers above, female below (Sept. to Feb.).

Fruits: Small, fleshy.

Uses: Cultivated as an ornamental. Decoction of roots used by farmers for dyspepsia; decoction in brandy used for kidney troubles. Stems and roots peeled and eaten raw, also used to make beer. Used in traditional medicine to ease childbirth, assist in the expulsion of the placenta in cattle and women and, mixed with other plants for kidney and bladder complaints.

Cultivation: Moist, but well aerated soil at the edge of a stream. Rich soil in full sun. Very cold winds and very hot sun can damage leaves. Not suitable for high humidity. Dry mulch in winter. Propagate from seed in autumn as soon as ripe and keep cool, or spring, or by division (leafy basal buds) in early spring.

Germination is slow, and seed rapidly loses viability. Protect from slugs and snails.

Opportunities:

Recommendation:

Related Species: In Chile, *G.chilensis* leaf stalks are eaten as a vegetable (panke).

Harpagophytum

Harpagophytum Two-Four South African species in the PEDALIACEAE

Harpagophytum procumbens DC.

Names: Devil's claw, grapple plant, wool spider, kloudoring

Occurrence:

Description:

Habit: Perennial.

Bark:

Leaves:

Flowers:

Fruits: Have woody grapples, about an inch (2.5 cm) long, pointed and barbed.

Animal distribution, nuisance to sheep herders.

Uses: Internationally traded. Tuber used as infusion to relieve fevers. Ointment applied to ulcers, sores and boils. Internally supposed to act as purgative.

Cultivation:

Opportunities:

Recommendation:

Related Species:

Bibliography: Mitteilungen aus dem Staatsinstitut für allgemeine Botanik in Hamburg, 13(1970)15.

Ocotea

Ocotea 200-230 tropical and sub-tropical species in the LAURACEAE

Ocotea bullata (Burchell) Baillon

Names: Stinkwood, black stinkwood, stinkhout, SA # 118

Occurrence: Along coastal area from Cape Town to KwaZulu Natal, in the high forests (knysna). Also in northern, South America.

Description: A medium to large evergreen tree from about 8m to 20 to 30 m.

Habit: Freshly cut trees smell, as does re-wetted timber.

Bark: Brown and scaly when old, pale and attractively colored when young.

Astringent, used for tanning.

Leaves: Large, oblong, 5 to 10 x 2.5 to 5 cm, aromatic, dark green, rather glossy, with conspicuous blisters or bubbles on the upper surface in the axil of the veins,

concentrated usually in lower half of leaf, corresponding to finely hair lined pits on the lower surface (bullae), apex tapering, often shortly attenuate, base broadly tapering, margin entire, wavy, petiole 1.5 to 2 cm long.

Flowers: Small, pale yellowish green in small clusters in the leaf axils, near the tips of the branches (December to February mainly, sporadically other times)

Fruits: Acorn like, oval about 2 cm long, the lower half or two thirds enveloped by the cup shaped receptacle (March to June, persists through till December).

Uses: Used for symbolic purposes to make a person “smell and become unpopular”.

Wood: Stinkwood, from the smell of the fresh cut wood, is a very useful and highly prized timber. Hard, light cream through dark brown to almost black. Rich golden glow. Finely textured, naturally lustrous and beautifully colored, takes polish well, and may be figured too; used previously for building, cabinets and carpentry work. Doors, window frames, beams, and very expensive high quality furniture. A protected plant in South Africa, being managed by the Department of forestry in the Knynsa forest.

Cultivation: Flowers subject to a fungal disease, fruits attacked by maggots, so seed scarce. Use fresh seed. Viable seed can be obtained from bird droppings.

O.usambarensis produces root suckers from stumps.

Opportunities:

Recommendation:

Related Species: *O. kenyensis* Bastard stinkwood. *O.usambarensis*

Camphorwood is a timber tree in Kenya, and Northern province Zambia.

O.pretiosa bark in Brazil is similar to cinnamon. Ocotea cymbarum oil is obtained from steam distillation of a Brazilian species, used as a source of safrole.

Pelargonium

Pelargonium Two hundred and fifty species, in the GERANIACEAE, chiefly endemic to South Africa and Namibia, a few Mediterranean and Australian.

Pelargonium sidoides DC.

Names: Umkcaloabo

Occurrence:

Description:

Habit: Soft wooded shrub?

Bark:

Leaves: Usually round, contain essential oils, may secrete resin droplets.

Flowers: 2 Upper petals differently marked to three lower.

Fruits: Seeds plumed like thistle down.

Uses: Internationally traded.

Wood:

Cultivation: Frost tender, can be treated like an annual. Don't like extreme heat or humidity. Sunny site, with light well drained, neutral soil. Avoid overwatering. Propagate from softwood cuttings from spring to fall.

Opportunities:

Recommendation:

Related Species: Oil used as substitute for attar of roses (mawah oil) is distilled in North Africa, Reunion and France from *P.odoratissimum* Ait. Some species have edible tubers, buds and/or leaves.

Bibliography: Arnoldia 34(1974)104 for species and scents.

Pittosporum

Pittosporum Two hundred tropical and sub-tropical old world species in the
PITTOSPORACEAE

Pittosporum viridiflorum Sims

Names: Cheesewood, Kasuur, Pittosporum, Cape Pittosporum

Occurrence: Widely distributed from Cape Town to the Zimbabwe border, Eastern Zimbabwe and in Congo, Mozambique and Malawi. NZ & Pacific.

Description: Sometimes a large shrub, more often a tree up to 10 m. Usually 10 ft. (3m) sometimes to 20 ft. (6 m.) 6-10 ft. (2-3 m.) spread. In Zululand forests reaches 20-30 m. Occurs over a wide range of altitudes, in deciduous woodland, scrub, in riverine fringe forest and in evergreen forest also on rocky outcrops.

Habit: Evergreen, thick clustered stems, with whorled, revolute leathery leaves. Usually free-branching. Hairy young stems.

Bark: Pale or darkish grey, smooth when young, roughish later, stem fluted in large specimens.

Leaves: Alternate, scattered or in whorls, very variable in size and shape, usually obovate to broadly oblanceolate, about 6 to 7 x 2 to 2.5 cm, but may be up to 11 x 4 cm, dark green or bluish green, leathery, dull to rather glossy, but a characteristic brilliant green when caught against the sunlight, upper surface often has a square pavement venation, conspicuous net veining on the lower surface, apex rounded or shortly attenuate, base tapering, margin entire, sometimes rolled under, petiolate.

Flowers: Small (0.25 in.) greenish-white, yellow-green to cream, strongly fragrant. Bisexual flowers, floral parts in fives, petals longer than the sepals, stamens free. Produced in terminal branched heads, corymb-like panicles (November to December).

Fruits: A small, creamy brown capsule 5 to 8 mm in diameter, up to ½ in. (1.5 cm.) long. Hard angled outer capsule, encloses sticky seeds, splits to release bright red seeds coated with a slow drying resin (May to September)..

Uses: Roasted bark from young trees used for dysentery. Bark smells sweet, (like liquorice) and a bitter taste. Used for stomach complaints and for black gall sickness and red water in cattle.

Wood: White, of little value? See Z.list.

Cultivation: Fertile, slightly acid, well drained soil, moist in summer, mulch. Full sun or part shade, shade tolerant, shelter in colder areas. Control aphids, mites, scale, mealybug and leafspot. Propagate from seed in fall, or spring or from tip cuttings in summer. Seeds germinate readily, especially when ripe, and semi-ripe cuttings strike easily. Layer or air layer. Attractive garden tree. Shelter from cold, drying winds. Minimum temp 41 F/5 C.

Opportunities:

Recommendation:

Related Species: *P.crassifolium* Karo NZ timber tree, *P.eugeniodes* NZ lemonwood, *P.undulatum* cheesewood, Australian timber used in golf clubs, oil extracted from flowers.

Rapanea

Rapanea, 140-150 tropical and sub-tropical shrubs or tree species in the MYRSINACEAE.

Rapanea melanophloeos (L.) Mez

Names: Cape Beech, Kaapse boekenhout. SA # 578, Rhod. # 830, Rapanea

Occurrence: From Cape Town to Transvaal. In Zimbabwe, eastern border, in Copperbelt, North-Western, North and Luapula Provinces Zambia, and also Congo and Tanzania. Tropical and S. Africa.

Description: A medium to tall tree, 4-10 m in ht., occasionally to 20 m. occurring in evergreen forest, in riverine fringes and sometimes in the drier coastal and mountain forests.

Habit:

Bark: Light grey, smooth to flaking, the stem is frequently fluted in large specimens and the young branches are square in section.

Leaves: Clustered near the ends of the branches, oblong to oblong-lanceolate, 5 to 13 cm. X 0.8 to 5 cm., thickly leathery, dull dark green above, lighter beneath, with many inconspicuous gland-dots which are visible when the leaf is held up to the light, young leaves red and shiny; apex broadly tapering, sometimes notched; base narrowly tapering; margin entire, rolled under; petiole up to 1.5 cm long, red, grooved above.

Flowers: Small, greenish or whitish, inconspicuous, in few flowered clusters, or fascicles, axillary and also arising below the leaves, when the old leaves have fallen. (June to August, continuing on to December).

Fruits: Spherical, thinly fleshy, up to 5 mm in diameter, on short stalks, massed along the branchlets just below the leaves, green becoming white and finally

purple; the fruits appear about three months after the flowers, and therefore may be found on the tree together (September to March).

Uses: Decotion of the bark used by the Zulus as an expectorant and an emetic.

Wood: Fine grained, very attractive and durable; works well and takes a fine polish. Used for cabinet and violins. Tree is an attractive hardy ornamental, but may take over and be difficult to eradicate.

Cultivation:

Opportunities:

Recommendation:

Related Species

Scilla

Scilla Forty Eurasian temperate, old world species in the HYACINTHACEAE.
Six in South Africa.

Scilla natalensis Planch.

Names: Blue Hyacinth, Large Blue Scilla; (Blouslangkop, Afrikaans); (kherere, South Sotho); (ichitha, imbizenkulu, ubulika, inguduza, Zulu).

Occurrence: South Africa, Lesotho. In damp grassland, cliffs and rocky slopes, coast to 2,000 m.

Description: Up to 1 m high, solitary or in large colonies, very variable.

Habit: Bulbous perennial. Bulb 30 cm diameter, half above ground, papery purplish brown.

Leaves: Erect, strap shaped. 4-8 semi-erect, grey-green, hairless or velvety, lance shaped, basal leaves to 8 in. (20 cm.) long, at flowering time, later extend to 12-24 in. (30-60 cm.) after flowering.

Flowers: Tall terminal raceme, 30 x 10 cm, of up to 100 flattish violet-blue, pink or white flowers, 0.5 –1 cm (1.5 cm.) across. (Sept. to Dec.) Perianth segments free. Sturdy, arching flowering stems elongate to 12 –48 in. (30-120 cm.)

Fruits: Ant dispersed seeds?

Uses: Poisonous to sheep. Used to make soap. Traditional treatment for internal tumours, boils, fractures and for lung disease in cattle.

Cultivation: Naturalize in lawns. Plant in fall, average soil in full sun to light shade. Divide in fall when crowded, or from seed in fall. Plant 3 in. (8 cm.) apart.

Check for viruses. Frost resistant.

Opportunities:

Recommendation:

Related Species: *S. lanceifolia* in Zambia, the bulb is mildly poisonous and has a digitalis-like action on the heart.

Siphonochilus

Siphonochilus, seven species in the ZINGIBERACEAE, mainly old world tropical, a few in south and central America, Two species in South Africa, found in KwaZulu Natal.

Siphonochilus aethiopicus (Schweinf.) B.I. Birtt [*Siphonochilus natalensis*, *Kaempferia aethiopica*, *K. ethelae*]

Names: African ginger, wild ginger; (Wildegemmer, Afrikaans); (sidvungulu, Swazi) (indungulu, isiphephetho, Zulu)

Occurrence: Extinct in the wild in KZN, Mpum. Previously found in forests. Now being tissue cultured for cultivation and container use in South Africa.

Description: Up to 1 m tall, rhizomatous perennial

Habit:

Leaves: 3-40 cm x 5-9 cm. deciduous

Flowers: 2-6, in inflorescence separate from leaf shoot, white to bright pink, yellow on lip, tube 3-4 cm, white, tepal lobes 6-8 cm wide (October to February) faintly scented. Male and female plants. Female smaller than male.

Fruits:

Uses: Traditionally cultivated for protection against lightning and snakes. Used to treat colds, coughs, and influenza, to treat hysteria, and "sprinkling medicine" for good crops.

Wood:

Cultivation:

Opportunities:

Recommendation:

Related Species:

Bibliography: Notes from the Royal Botanic Garden Edinburgh 40(1982)372

Stangeria

Stangeria One genus and a single species in the STANGERIACEAE (Cycadaceae), endemic to South Africa, found from the Eastern Cape to KwaZulu Natal.

Stangeria eriopus Nash (Syn. *S. paradoxa* T. Moore)

Names: Natal grass cycad, *Stangeria*, (Bobbejaankos, Afrikaans); (umfingwani, umncuma (cone), Xhosa); (imfingo, Zulu).

Occurrence: Eastern Cape, KwaZulu Natal. Dry open woodland and scrub.

Widespread in coastal grassland and forest, Eastern Cape to southern Mozambique.

Description: Low growing fern like plant, first described as a fern (*Lomaria e.*). Wide variation between forest (larger, leathery) and grassland (smaller, softer) plants.

Habit: A fern-like cycad. Perennial with swollen woody largely underground stem, cylindrical to turnip shaped, tuberous roots, tip produces rosettes of leaves. 0.25 –1 m high, up to 4.5 ft. (1.5m.) high, 3-6 ft. (1-2 m.) spread.

Leaves: Very variable in size and shape. 0.25-2 m, 5-20 pairs of leaflets, 40x 6 cm, midrib, present, side veins forked. Long stalked, oval to oblong, pinnate leaves. Firm, but lack leathery texture of most cycads. 0.75-6 ft. (0.25-2 m) long, each with 10-40 lance shaped to oblong, wavy, often papery. Olive to deep-green leaflets, with entire, lobed or toothed margins. New stalks velvety.

Flowers: Separate male and female, cone-like spikes, center of rosette in summer. Cylindrical, felted, grey to yellow-brown to 7 in. (18cm.) long.

Fruits: Cones, 1 per plant, stalk 12 cm, covered in silvery hairs at first, maturing brownish (May to Oct.) Male: 10-15 x 3-5 cm, female 18-20 x 8-10 cm. Seeds red.

Uses: Parts are reputed to be eaten. Used to treat high blood pressure and pain and as a charm to ward off evil and protect warriors.

Wood:

Cultivation: Humus rich. Well drained soil, bright filtered light, i.e. dappled shade, high humidity. Water frequently in growing season, sparingly in winter. Surface sow seed on damp sand, at 75-86 degrees F. (24-30C). Pot up as taproot forms. Minimum temperatures 59 F/15 C. Grows easily from seed.

Opportunities:

Recommendation:

Related Species

Warburgia

Warburgia, three species, in the CANELLACEAE, (Winteranaceae) found in East and Southern Africa.

Warburgia salutaris (Bertol.f.) Chiov. (Syn. *Chibaca salutaris* Bertol. f.; *W.breyeri* Pott. *W.ugandensis*.

Names: Pepperbark Tree, Peperbasboom, SA # 488, Rhod. # 720, muranga

Occurrence: In South western Zimbabwe, north-west of Chipinga (rare) and Kwazulu to Transvaal in South Africa. In Tanzania, southern Congo and Uganda? Declining in South Africa.

Description: A slender tree, 5-10 metres in height, can be 20 m. Found in evergreen forest and woody ravines.

Habit:

Bark: Rich brown, rough.

Leaves: Alternate, simple, aromatic, elliptic to lanceolate, 4.5 to 11 x 1 to 3 cm., glossy dark green above, paler green and dull beneath, midrib frequently off center, apex and base tapering, margin entire, petiole 1 to 3 cm long.

Flowers: White or greenish, up to 7 mm in diameter, solitary, axillary, or in a few tight flowered heads, or cymes. Bisexual, sepals 3, petals 10 in 2 whorls, obovate, gland dotted, overlapping; stamens 10, joined to form a tube which is a prominent structure in the center of the flower, enveloping the ovary and most of the style, ovary elongate-oblong. Flowers April.

Fruits: A berry, spherical, up to 4 cm in diameter, skin leathery, glandular, black when mature. October to January.

Uses: Inner bark is reddish, bitter and peppery. Used for coughs, colds, as snuff for headaches and to clear the sinuses, (powdered bark mixed with bark from *Erythrophleum lasianthum*. Bark chewed or smoke from burning bark inhaled for chest complaints, bark boiled in water is thought to protect against malaria.

Wood: Heartwood is pale or greenish, darkening on exposure to the air. Oily and aromatic when fresh. Saws, planes and polishes well, but is hard wearing, or not? durable. Cabinetwork, furniture, trinket boxes.

Cultivation: Seed scarce, reproduces from cuttings.

Opportunities: Expensive, small piece of bark sells for ? Larger trees have been destroyed.

Recommendation:

Related Species: *W.ugandensis* East African greenheart wood turns green to brown after felling, works and polishes well, but is not durable. Bark used for stomach problems. Leaves used as chilli substitute. Resin used as glue for tool handles.

Xysmalobium

Xysmalobium Twenty to forty species in the ASCLEPIADACEAE, found in tropical and Southern Africa

Xysmalobium undulatum R.Br

Names: Uzara

Occurrence:

Description:

Habit:

Bark:

Leaves:

Flowers:

Fruits:

Uses: Contains cardenolides similar to *Calotropis*.

Wood:

Cultivation:

Opportunities: Internationally traded.

Recommendation:

Related Species: *X. heudelotianum* has watery turnip shaped roots (yakhop) eaten as food in Senegambia.

Few medicinal plants are cultivated and only *Warburgia salutaris* (Bertol.f.) Chiov. (pepperbark tree) and *Siphonochilus aethiopicus* (Schweinf.) B.I. Birtt (African ginger) are known to be propagated for cultivation.

Phytomedicine plants in South Africa with a position in the international trade are Cape aloes (*Aloe ferox* Miller), buchu (*Agathosma* spp.), devil's claw (*Harpagophytum procumbens* DC), umkcaloabo (*Pelargonium sidoides* DC) and uzara (*Xysmalobium undulatum* R.Br) (N. Gericke 1998 unpubl. report). Buchu is cultivated commercially, but is also harvested in the wild, although under supplied. This can lead to over utilization of the natural habitat. *Aloe ferox* Miller is sustainably harvested from the wild. In the case of devil's claw the natural habitat can be over utilized.

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Appendix B

Some contact information (To be completed)

Local companies

European companies

US companies